

WHAT IS CLAIMED IS:

- 1 A sputter cathode target comprising:
the target having a 100 weight percent;
5 greater than about 90 and less than 100 weight
percent zinc, and
majority of balance of weight percent tin.
2. The sputter cathode target wherein the weight
10 percent of tin is greater than zero but less than 10 weight
percent.
3. A sputter deposited film comprising:
a dielectric film having greater than about 90 and
15 less than 100 weight percent zinc, and
greater than zero but less than 10 weight percent
tin.
4. An infrared reflective coated article
20 comprising:
a substrate;
a dielectric layer sputter deposited over the
substrate, the layer comprising a first zinc stannate film
deposited over the substrate having zinc in weight percent
25 range of equal to and greater than 10 and equal to and less
than 90, and tin in the weight percent range of equal to and
less than 90 and equal to and greater than 10, and an
electrical enhancing film deposited over the zinc stannate
film, the electrical enhancing film selected from the group of
30 films consisting of zinc oxide, tin oxide film and a second
zinc stannate film wherein the composition of the first zinc
stannate film is at least about 5 weight percent different
than the composition of the second zinc stannate film, and
an infrared reflective layer deposited on the
35 dielectric layer.

Substrate

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6. The article stack of claim 4 wherein the infrared reflective layer is a silver film and the silver film is deposited on the second zinc stannate film.

a metal primer layer over the first infrared reflective layer;

8. The article of claim 7 wherein the second dielectric layer is a zinc stannate film having 10-90 weight percent zinc and 90-10 weight percent tin.

a first metal primer layer over the first infrared reflective metal layer;

a second infrared reflective layer over the second dielectric layer;

a second metal primer layer over the second infrared reflective layer;

35 a third dielectric layer including over the second
metal primer layer; and

optionally a protective film over the third dielectric layer.

10. The article of claim 9 wherein at least one of the second and third dielectric layers includes a zinc stannate film having 10-90 weight percent zinc and 90-10 weight percent tin.

11. The coating stack of claim 4 wherein the dielectric layer is a first dielectric layer and the infrared reflective layer is a first infrared reflective layer and further including:

a first metal primer layer over the first reflective layer;

a second dielectric layer over the first metal primer layer, the second dielectric layer comprising a first dielectric film and a zinc stannate film defined as a first zinc stannate film, the first zinc stannate film having zinc in the weight percent range of equal to and greater than 10 and equal to and less than 90 and tin in the weight percent range of equal to and greater than 10 and equal to and less than 90, the first dielectric layer deposited over the first metal primer layer;

a second infrared reflective layer deposited over the second dielectric layer;

a second metal primer layer deposited over the second infrared reflective layer;

a third dielectric layer deposited over the second primer layer; and

optionally a protective layer over the third dielectric layer.

12. The coating stack of claim 11 wherein the first dielectric film of the second dielectric layer comprises a zinc oxide film; a zinc oxide, tin oxide film or a zinc stannate film defined as a second zinc stannate film, the second zinc stannate film having a composition different than

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the composition of the first zinc stannate film of the second dielectric layer.

13. The coating stack of claim 10 wherein the second zinc stannate film of the second dielectric layer has zinc in the weight percent range of equal to and greater than 60 and equal to and less than 90 and tin in the weight percent of equal to and greater than 10 and equal to and less than 40, and the third dielectric layer is a zinc stannate film.

14. The coating stack of claim 4 wherein the dielectric layer is a first dielectric layer and the infrared reflective layer is a first infrared reflective layer and further including:

a first metal primer layer over the first reflective layer;

a second dielectric layer over the first metal primer film;

a second infrared reflective layer over the second dielectric layer;

a second metal primer layer over the second infrared reflecting metal layer;

a third dielectric layer over the second metal primer layer, the second dielectric layer comprising a first

dielectric film and a zinc stannate film defined as a first zinc stannate film, the first zinc stannate film having zinc in a weight percent with the range of equal to and greater than 10 and equal to and less than 90 and tin within the weight percent range of equal to and less than 90 and equal to and greater than 10, the third dielectric film deposited over the second metal primer; and

optionally a protective film overlying the third dielectric film.

15. The article of claim 14 wherein the first dielectric film of the third dielectric layer is selected from the group consisting of a zinc oxide film; a zinc oxide, tin

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oxide film or a zinc stannate film defined as a second zinc stannate film, the second zinc stannate film having a composition different than the composition of the first zinc stannate film of third dielectric layer.

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16. The article of claim 15 wherein the second zinc stannate film of the third dielectric layer has zinc in the weight percent range of equal to and greater than 60 and equal to and less than 90 and tin in the weight percent range of equal to and greater than 10 and equal to and less than 40.

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17. The article of claim 4 wherein the dielectric layer is a first dielectric layer and the infrared reflective layer is a first infrared reflective layer and further including:

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a first metal primer layer over the first reflective layer;

a second dielectric layer over the first metal primer layer, the second dielectric layer comprising a first dielectric film and a ~~first~~ zinc stannate film defined as a first zinc stannate film, the first zinc stannate film having zinc in a weight percent within the range of equal to and greater than 10 and equal to and less than 90 and tin within the weight percent range of equal to and less than 90 and

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equal to and greater than 10, the second dielectric film deposited over the first metal primer layer;

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a second infrared reflective layer over the first zinc stannate film of the second dielectric layer;

a second metal primer layer over the second infrared reflective layer;

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a third dielectric layer over the second metal primer layer, the third dielectric layer comprising a first dielectric film and a zinc stannate film defined as a first zinc stannate film, the first zinc stannate film having zinc in a weight percent within the range of equal to and greater than 10 and equal to and less than 90 and tin within the weight percent range of equal to and less than 90 and equal to

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and greater than 10, the third dielectric film deposited over the second metal primer layer; and

optionally a protective film overlying the first zinc stannate film of the dielectric layer.

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18. The coating stack of claim 17 wherein the first dielectric film of the second dielectric layer and the first dielectric film of the third dielectric layer each has a film selected from the group consisting of zinc oxide film; zinc oxide, tin oxide film or second zinc stannate film having a composition different than the composition of the first zinc stannate film in the respective same second or third dielectric layer.

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19. The coating stack of claim 18 wherein the second zinc stannate film of the first and second dielectric layer each include zinc in the weight percent range of equal to and greater than 60 and equal to and less than 90 and tin in the weight percent of equal to and greater than 10 and equal to and less than 40.

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20. The coating stack of claim 17 wherein the second dielectric layer further includes a third dielectric film over the first zinc stannate film of the second dielectric layer.

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21. The coating stack of claim 18 wherein the second dielectric layer further includes a third dielectric film over the first zinc stannate film of the second dielectric layer wherein the third dielectric film of the second dielectric layer is a film selected from the group consisting of zinc oxide film, zinc oxide, tin oxide film and a zinc stannate film defined as a third zinc stannate film, the third zinc stannate film has a composition different than the composition of the zinc stannate film of the second dielectric layer closest to the third zinc stannate film.

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22. The coating of claim 18 wherein the second dielectric film of the ^{second/ D10 4/29/99 O.A.M. 4/29/99 JEP 4/29/99} dielectric layer and the second dielectric film of the third dielectric second layer each comprises a zinc oxide film; a zinc oxide, tin oxide film or a second zinc stannate film having a composition different than the ^{composition D10 4/29/99 O.A.M. 4/29/99 JEP 4/29/99} composition of the first zinc stannate film of third dielectric layer.

23. The coating stack of claim 220 wherein the first and third dielectric films of the second dielectric layer and the first dielectric film of the third dielectric layer each include zinc in the weight percent range of equal to and greater than 60 and equal to and less than 90 and tin in the weight percent of equal to and greater than 10 and equal to and less than 40. ^{22 D10 4/29/99 O.A.M. 4/29/99 JEP 4/29/99}

24. The coating stack of claim 20 wherein the second zinc stannate film of the first dielectric layer is on the glass piece and has a thickness in the range of 230 ± 40 Angstroms Å; the first zinc stannate film of the first dielectric layer is on the second zinc stannate film of the first dielectric layer and has a thickness in the range of 80 ± 40 Å; the first infrared reflective metal layer is a first silver film deposited on the first zinc stannate film of the first dielectric layer and has a thickness in the range of 110 ± 30 Å, the metal primer layer is a titanium film deposited on the first silver layer and has a thickness in the range of 17-26 Å; the first dielectric film of the second dielectric layer is deposited on the titanium film and has a thickness in the range of 80 ± 40 Å; the first zinc stannate film of the second dielectric layer is deposited on the first dielectric film of the second dielectric layer and has a thickness in the range of 740 ± 40 Å; the second infrared reflective metal layer is a second silver film deposited on the second dielectric film of the second dielectric layer and has a thickness in the range of 110 ± 38 Å; the second primer film is a titanium film deposited on the second silver layer and having a thickness in

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the range of 18 - 31Å; the first dielectric film of the third dielectric layer is deposited on the second titanium film and has a thickness in the range of $80 \pm 40\text{\AA}$; the first zinc stannate layer of the third dielectric layer is deposited on the first dielectric film of the third dielectric layer and has a thickness in the range of $120 \pm 40\text{\AA}$, and the protective layer is a titanium metal film deposited on the first zinc stannate layer of the third dielectric layer and has a thickness in the range of $29 \pm 3\text{\AA}$.

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25. A coated article comprising:

a substrate;

a first dielectric layer over the substrate;

a first infrared reflective layer over the first

15 dielectric layer;

a first metal primer layer over the first infrared reflective layer;

a second dielectric layer over the first metal primer, the second dielectric layer having a first dielectric film

20 selected from the group consisting of zinc oxide, tin oxide film and a first zinc stannate film, and a second dielectric film the second dielectric film having a composition different than the first dielectric film of the second dielectric layer;

25 a second infrared reflective layer over the second dielectric layer;

a second primer layer over the second reflective layer;

a third dielectric layer over the second metal primer layer; and

30 optionally a protective layer overlying the third dielectric layer.

26. The coated article of claim 25 wherein the first dielectric layer includes a zinc stannate film, the second dielectric film of the second dielectric layer is a zinc stannate film and the third dielectric layer includes a zinc stannate film, each of the zinc stannate films having

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zinc in the weight percent range of 10-90 and tin in the weight percent range of 90-10.

27. The coated article of claim 26 wherein the first dielectric film of the second dielectric layer is the first zinc stannate film having zinc in the weight percent range of equal to and greater than 90 and equal to and less than 60 and tin in the weight percent range of equal to and greater than 10 and equal to and less than 40.

28. A coated article comprising:
a substrate;
a first dielectric layer over the substrate;
a first infrared reflective layer over the first dielectric layer;
a first metal primer layer over the first infrared reflective layer;
a second dielectric layer over the first metal primer layer;
a second infrared reflective layer over the second dielectric layer;
a second metal primer layer over the second reflective metal layer;
a third dielectric film having a first dielectric film selected from the group consisting of zinc oxide film; zinc oxide, tin oxide film; a first zinc stannate film and a second dielectric film overlying the first dielectric film, the second dielectric film having a composition different from the first dielectric film; and
optionally a protective film overlying the third dielectric layer.

29. The coated article of claim 28 wherein the first and second dielectric layers are each a zinc stannate film, and the second dielectric film of the third dielectric layer is a zinc stannate film and each of the zinc stannate

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films has zinc in the weight percent range of 10-90 and tin in the weight percent range of 90-10.

5 30. The coated article of claim 29 wherein the first dielectric film of the second dielectric layer has zinc in the weight percent range of equal to and greater than 90 and equal to and less than 60 and tin in the weight percent range of equal to and greater than 10 and equal to and less than 40.

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31. A coated article comprising:
a substrate;
a first dielectric layer over the substrate;
a first infrared reflective layer over the first
15 dielectric layer;
a first primer layer over the first reflective metal layer;
a second dielectric layer having a first dielectric film selected from the group consisting of zinc oxide, tin
20 oxide film and a first zinc stannate film, and a second dielectric film overlying the first dielectric film having a composition different than the first dielectric film of the second dielectric layer;
a second infrared reflective layer over the second
25 dielectric layer;
a second primer layer over the second reflective layer;
a third dielectric layer over the second metal primer layer, the third dielectric layer having a first
30 dielectric film selected from the group consisting of a zinc oxide, tin oxide film and a first zinc stannate film and a second dielectric film, the second dielectric film of the third dielectric layer have a composition different than the composition of the second dielectric film of the third
35 dielectric layer; and
optionally a protective film overlying the third dielectric layer.

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32. The coated article of claim 31 wherein the first dielectric layer, the second dielectric film of the second and third dielectric layers are each a zinc stannate film having zinc in the weight percent range of 10-90 and tin in the weight percent range of 90-10.

33. The coated article of claim 32 wherein the first dielectric film of the second and third dielectric layers are each a zinc stannate film having zinc in the weight percent range of equal to and greater than 90 and equal to and less than 60 and tin in the weight percent range of equal to and greater than 10 and equal to and less than 40.

34. The coated article of claim 32 wherein the coated article is a transparency.

35. The coated article of claim 34 wherein the coated article is an automotive transparency.

36. The coated article of claim 35 wherein the automobile transparency is an automotive windshield having a pair of glass sheets laminated together and one of the sheets is fabricated from the substrate having the coating.

37. A method of making an automobile transparency comprising:

applying a coating on a glass substrate having the following:

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a first dielectric layer over a glass substrate;
a first infrared reflecting metal layer over the first dielectric film:

a first metal primer layer over the first reflective layer;

a second dielectric layer over the first metal primer layer;

a second infrared reflective layer over the second dielectric layer;

a second metal primer layer over the second infrared reflective layer;

5 a protective film overlying the first zinc stannate film of the third dielectric layer, wherein at least one of the dielectric layers includes a first dielectric film selected from the group consisting of zinc oxide, tin oxide and a first zinc stannate film and a second dielectric film
10 including a second zinc stannate film having a composition different than the first zinc stannate film and a composition of 10-90 weight percent zinc and 90-10 weight percent tin;

processing the coated substrate to provide a coated windshield blank wherein the processing step includes heating
15 the coated substrate to its bending temperature and after heating the coating has reduced haze;

laminating the coated blank to another piece of glass to provide the automobile windshield.

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